Static Universe probe with Type Ia SN observations

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The recent works of a number of authors show that the phenomena observed for Type Ia supernovae such as dimming, light curve broadening and spectra aging can be explained within Static Universe cosmology. Khaidarov and Marosi have shown that the Hubble diagram for Type Ia SN satisfies the "tired light" model where photons experience exponential energy depletion. The time-scale stretching (light curve broadening and spectra aging) can be explained by two mechanisms: random traveling time of photons (aka signal smearing) and dispersion of light in interstellar space. Both mechanisms were independently suggested by Chepik and Ashmore. The phenomena of signal smearing and light dispersion are well supported by observations of pulsars.

I have conducted a study to assess the influence of random variations in traveling time of photons on light-curve broadening and spectra aging. The results of the study show the following.

The time-scale stretching can be different for different bands as well as for the rising and declining part of a light-curve. (The conclusion of Standard Cosmology proponents about universality of time-scale stretching is questionable because it based on the measurements done using universally stretched light-curve templates.)

Another outcome of the study is that in at-rest infrared and near-infrared bands the second maximum will not be observed for high redshifts. The available photometric measurements for high-redshift SN in at-rest infrared bands (Carnegie Supernova Project) have too few photometric points to build robust light-curves (without fitting to universally stretched template) and to make the decisive conclusion about presence or absence of second maximum.

The study of spectra aging shows that it can be explained equally well within both Standard Cosmology and Static Universe for declining part. However within the period of 10 days prior to maximum in B-band the spectra aging would vary for different cosmologies for high redshifts. Unfortunately, the systematic spectra aging observations were conducted only for declining part of SN light-curves.

The Standard Cosmology model cannot be proven if the observation methodology is biased by Standard Cosmology assumptions. To avoid such a bias I suggest the following measures.

The methodology for selecting candidates for Type Ia SN has been based on fitting observed bursts to light-curve templates. Only the candidates that fit well were confirmed by spectral measurements. Such methodology may introduce the selection bias. There may be SN having Type Ia spectrum but not fitting well to existing light-curve templates. I suggest either not to use light-curve templates for selecting Type Ia candidates or to use light-curve template of variety of cosmologies and/or essentially loosen χ^2-criterion of fitting.

This consideration is especially important for SN observations in at-rest infrared and near-infrared bands. The absence of second maximum cannot be used to cut a SN from being a Type Ia candidate. In such observations only spectral measurements may be used for determining the type of SN.

In recent years the main Type Ia SN observations were done for at-rest B-V bands. I suggest that the measurements in all possible bands should be equally important.

Fitting to light-curve templates introduces bias of specific cosmology in measurements of light curve parameters. I suggest that the photometric measurements should be taken frequently enough (at least every 2-3 days) in order to build reliable light curves without any fitting to light-curve templates.

It is very important to conduct frequent spectral measurements during 10 days (or more) prior to maximum in B-band. This can be one of the arguments which would support or refute a specific cosmology based on spectra aging pattern. The frequent spectral measurements should be also taken for the declining time to detect possible non-linearities.

In order to conduct Type Ia SN studies it is very important to have Type Ia SN spectra template lasting up to 120^{th} day or more after maximum in B-band. There are three major spectra templates: SALT2, Nugent and Hsiao. The longest template (Hsiao) lasts only to 85 day after maximum in B-Band.

The results of observations should be accessible in public domain in all stages: raw data and the data after any stage of processing. Such transparency is important to enable development of alternative cosmologies and to gain public trust to the research itself and to its theoretical interpretations.